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AUG 03 2007

Application Serial No.: 10/796,327
Amendment and Response to May 3, 2007 Non-Final Office Action**REMARKS**

Claims 1-24 were pending in the application. Claims 1, 11-13, 15 and 25-27 have been amended. Claims 10 and 24 have been cancelled. Claims 1 and 15 are independent claims. No new matter has been added by this amendment.

Applicant respectfully submits that the present application is now in condition for allowance. Accordingly, reconsideration and allowance of the present application are respectfully requested.

Claim Rejections

Claims 1, 5-7, 9, 15, 19-21 and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,780,152 (Ustuner et al.).

Claims 10-14 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,780,152 (Ustuner et al.) in view of U.S. Patent No. 7,158,610 (Mostafavi).

Reconsideration and withdrawal of the rejection are respectfully requested.

Claim 1

Independent claim 1 has been amended to recite the subject matter of original claim 10.

Independent claim 1 now recites a method comprising: acquiring a first plurality of images of a first portion of a body undergoing substantially periodic motion; acquiring a second plurality of images of a second portion of the body, the second portion comprising a portion of the first portion; determining a correlation between at least one of the first plurality of images and at least one of the second plurality of images; generating a combined image of the first portion and the second portion based on the at least one of the first plurality of images and the at least one of the second plurality of images, the combined image corresponding to a first phase of the periodic motion; acquiring a third plurality of images of a third portion of the body, the third

Application Serial No.: 10/796,327
Amendment and Response to May 3, 2007 Non-Final Office Action

portion comprising a next portion of the second portion; determining a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generating a combined image of the second portion and the third portion based on the at least one of the second plurality of images and the at least one of the third plurality of images, the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion.

Neither Ustuner et al., nor Mostafavi, nor any proper combination thereof proposed in the Office Action, teaches or suggests the method of claim 1.

Ustuner et al. disclose that where two images are associated with a physiological cycle, the processor 18 temporally aligns the images so that the selected first and second images are associated with the same phase of the physiological cycle (col. 7, lines 18-22). The processor combines the spatially and temporally aligned images (col. 7, lines 22-23).

However, at the very least, Ustuner et al. do not teach or suggest a method that includes the combination of generating a combined image of the first portion and the second portion, the combined image corresponding to a first phase of the periodic motion; acquiring a third plurality of images of a third portion of the body, the third portion comprising a next portion of the second portion; determining a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generating a combined image of the second portion and the third portion based on the at least one of the second plurality of images and the at least one of the third plurality of images, the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion, as recited in claim 1.

For at least the reasons above, Ustuner et al. do not teach or suggest the method of claim 1.

The Office Action states that Mostafavi discloses systems and methods for processing x-ray images comprising acquiring a third plurality of images of a third portion of the body, the third portion comprising a next portion of the second portion; determining a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generating a combined image of the second portion and the third portion based on the at least

Application Serial No.: 10/796.327
Amendment and Response to May 3, 2007 Non-Final Office Action

one of the second plurality of images and the at least one of the third plurality of images, the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion.

The Office Action further states that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a third plurality of images of a third portion of the body as taught by Mostafavi in the system of Ustuner because Mostafavi provides Ustuner an improved system for visualization of internal tissue without use of internal markers would be useful and the x-ray image processing technique can be used to detect a motion of a target tissue, and a medical procedure may be gated based on the detected motion.

Applicants respectfully disagree.

Applicant notes the cited portion of Mostafavi, which states that in one embodiment, each cross correlation between the enhanced input image and a template results in a 2D correlation function with a correlation peak (col. 5, lines 18-20). In each correlation function, the location of the peak indicates the position of the target region 34, and the value of the peak indicates a degree of match between the input fluoroscopic image and the template (col. 5, lines 20-24). The template that provides the highest peak value is then selected as the matching template, and the corresponding peak position in the correlation function is used to determine the position of the target region 34 (col. 5, lines 24-28).

The cited portion of Mostafavi also states that to gate a medical treatment on the target region 34 of the patient 30 undergoing a fluoroscopic imaging, a real-time input fluoroscopic image is generated using the fluoroscopic system 10 of FIG. 1 (Step 1004) (col. 12, lines 5-8). A composite image CI is created by subtracting the image in the ROI in the previous input fluoroscopic image from the image in the ROI in the current input fluoroscopic image (Step 1008) (col. 12, lines 17-20). For example, for the third input fluoroscopic image IFI_3 generated in a sequence, a corresponding composite image CI_3 is created by subtracting the image in the ROI in the previous input fluoroscopic image (i.e., the second fluoroscopic image IFI_2) from the third input fluoroscopic image IFI_3 (i.e., $CI_n = IFI_n - IFI_{n-1}$) (col. 12, lines 20-25). It should be understood that this step needs not be performed for the first input fluoroscopic image in the sequence since there is no previous input fluoroscopic image before the first input fluoroscopic image (col. 12, lines 25-29). In one embodiment, the variance of the pixels in the composite

Application Serial No.: 10/796,327
Amendment and Response to May 3, 2007 Non-Final Office Action

image, which is associated with a contrast of the composite image CI, may be calculated over the ROI, and may be used as a measure of the extent of motion undergone by the tissue within the ROI (e.g., the target region 34) (col. 12, lines 31-36).

Lastly, the cited portion of Mostafavi recites, in claim 1, a method of processing a x-ray image, comprising: collecting a first x-ray image and a second x-ray image; determining a composite image based on the first and second x-ray images; collecting a third x-ray image, wherein at least a portion of the first x-ray image and at least a portion of the third x-ray image comprise images of a same portion of an object; and enhancing a feature in the third x-ray image by adjusting the third x-ray image based on the composite image; wherein the third x-ray image is collected without performing a weighted subtraction of the first x-ray image (col. 16, lines 64- col. 17, line 8). Claim 3 recites the method of claim 1, wherein the first, second, and third x-ray images each contains an image of at least a portion of an animal body (col. 17, lines 11-13). Claim 8 recites the method of claim 1, wherein the feature comprises a moving feature, which is a characteristic in the third x-ray image due to a movement of the portion of the object (col. 17, lines 24-26).

However, at the very least, and contrary to the assertion in the Office Action, such portions of Mostafavi do not teach or suggest a combined image of the second portion and the third portion corresponding to the recited first phase of the periodic motion.

Indeed, Mostafavi appear to teach away from a combined image of the second portion and the third portion corresponding to the recited first phase of the periodic motion.

For at least the reasons above, neither Ustuner et al., nor Mostafavi, nor any combination proposed in the Office Action, teaches or suggests the method of claim 1.

Applicant also notes that Mostafavi creates a composite image without temporally aligning the images. In contrast thereto, Ustuner et al. teach that sets of images are temporally aligned so that images in the sets of images correspond to the same set of phases of the cardiac cycle in act 38 (col. 8, lines 26-29). The temporally aligned images are spatially aligned in act 40 (col. 8, lines 29-30). The temporally and spatially aligned images are combined in act 42 (col. 8, lines 30-32).

Application Serial No.: 10/796.327
Amendment and Response to May 3, 2007 Non-Final Office Action

In view thereof, Applicant respectfully submits that it would not have been obvious to modify the system of Ustuner et al to use the method of Mostafavi, as proposed by the Office Action.

For at least the reasons above, neither Ustuner et al., nor Mostafavi, nor any proper combination thereof proposed in the Office Action, teaches or suggests the method of claim 1.

Accordingly, reconsideration and allowance of independent claim 1 is respectfully requested.

In the event that the Examiner decides to again reject independent claim 1 in view of Ustuner et al. and Mostafavi (or any other art), ~~the Examiner~~ the Examiner is kindly requested to explain, with particularity, how the cited portions of such art teach or suggest a method that includes generating a combined image of the first portion and the second portion, the combined image corresponding to a first phase of the periodic motion; acquiring a third plurality of images of a third portion of the body, the third portion comprising a next portion of the second portion; determining a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generating a combined image of the second portion and the third portion based on the at least one of the second plurality of images and the at least one of the third plurality of images, the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion, as recited in claim 1.

Claim 15

Independent claim 15 has been amended to recite the subject matter of original claim 24.

Independent claim 15 now recites an apparatus comprising: a memory storing processor-executable process steps; and a processor in communication with the memory and operative in conjunction with the stored process steps to: acquire a first plurality of images of a first portion of a body undergoing substantially periodic motion; acquire a second plurality of images of a second portion of the body, the second portion comprising a portion of the first portion; determine a correlation between at least one of the first plurality of images and at least one of the second plurality of images; generate a combined image of the first portion and the second portion



Application Serial No.: 10/796,327
Amendment and Response to May 3, 2007 Non-Final Office Action

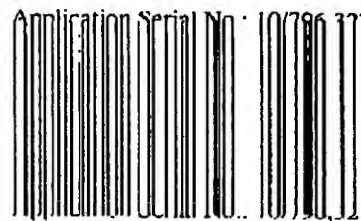
based on the at least one of the first plurality of images and the at least one of the second plurality of images, the combined image corresponding to a first phase of the periodic motion; acquire a third plurality of images of a third portion of the body, the third portion comprising a next portion of the second portion; determine a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generate a combined image of the second portion and the third portion based on the at least one of the second plurality of images and the at least one of the third plurality of images, the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion.

Neither Ustuner et al., nor Mostafavi, nor any proper combination thereof proposed in the Office Action, teaches or suggests the apparatus of claim 15.

At the very least, Ustuner et al. do not teach or suggest an apparatus comprising a processor operative in conjunction with stored process steps to: generate a combined image of the first portion and the second portion, the combined image corresponding to a first phase of the periodic motion; acquire a third plurality of images of a third portion of the body, the third portion comprising a next portion of the second portion; determine a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generate a combined image of the second portion and the third portion based on the at least one of the second plurality of images and the at least one of the third plurality of images, the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion, as recited in claim 15.

For at least the reasons above, Ustuner et al. do not teach or suggest the apparatus of claim 15.

The Office Action states that Mostafavi discloses systems and methods for processing x-ray images comprising the steps of: acquire a third plurality of images of a third portion of the body, the third portion comprising a next portion of the second portion; determine a correlation between the at least one of the second plurality of images and at least one of the third plurality of images; and generate a combined image of the second portion and the third portion based on the at least one of the second plurality of images and the at least one of the third plurality of images,



Amendment and Response to May 3, 2007 Non-Final Office Action

the combined image of the second portion and the third portion corresponding to the first phase of the periodic motion.

The Office Action further states that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a third plurality of images of a third portion of the body as taught by Mostafavi in the system of Ustuner because Mostafavi provides Ustuner an improved system for visualization of internal tissue without use of internal markers would be useful and the x-ray image processing technique can be used to detect a motion of a target tissue, and a medical procedure may be gated based on the detected motion.

Applicants respectfully disagree.

At the very least, and contrary to the assertion in the Office Action, Mostafavi do not teach or suggest a combined image of the second portion and the third portion corresponding to the recited first phase of the periodic motion.

Indeed, Mostafavi appear to teach away from a combined image of the second portion and the third portion corresponding to the recited first phase of the periodic motion.

Thus, neither Ustuner et al., nor Mostafavi, nor any combination proposed in the Office Action, teaches or suggests the apparatus of claim 15.

Applicant also notes that Mostafavi creates a composite image without temporally aligning the images. In contrast thereto, Ustuner et al. teach that sets of images are temporally aligned so that images in the sets of images correspond to the same set of phases of the cardiac cycle in act 38 (col. 8, lines 26-29). The temporally aligned images are spatially aligned in act 40 (col. 8, lines 29-30). The temporally and spatially aligned images are combined in act 42 (col. 8, lines 30-32).

In view thereof, Applicant respectfully submits that it would not have been obvious to modify the system of Ustuner et al. to use the method of Mostafavi, as proposed by the Office Action.

For at least the reasons above, neither Ustuner et al., nor Mostafavi, nor any proper combination thereof proposed in the Office Action, teaches or suggests the apparatus of claim 15.

Accordingly, reconsideration and allowance of independent claim 15 is respectfully requested.

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~~AUG 03 2007~~

Application Serial No.: 10/796.327
Amendment and Response to May 3, 2007 Non-Final Office Action

Dependent claims

Claims 2-9 and 11-14 depend from independent claim 1 and should be allowed for at least the reasons set forth above with respect to independent claim 1.

Claims 16-23 and 25-28 depend from independent claim 15 and should be allowed for at least the reasons set forth above with respect to independent claim 15.

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AUG 03 2007

Application Serial No.: 10/796.327
Amendment and Response to May 3, 2007 Non-Final Office Action**CONCLUSION**

For at least the reasons set forth above, Applicants respectfully submit that the present application is in condition for allowance. Accordingly, reconsideration and allowance of the present application are respectfully requested.

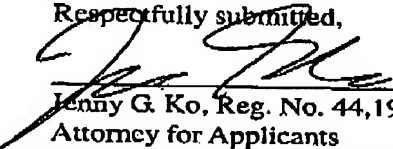
Because the reasons set forth above are sufficient to overcome the rejections set forth in the outstanding Office Action, Applicants do not address some of the assertions set forth therein and/or other possible reasons for overcoming the rejections. Nonetheless, Applicants reserve the right to address such assertions and/or to present other possible reasons for overcoming the rejections in any future paper and/or proceeding.

If the Examiner believes that a telephone interview would expedite the prosecution of this application in any way, the Examiner is cordially requested to contact the undersigned via telephone at (650) 694-5810.

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